

lesson 2: it's what's inside that counts

estimated time

2–4 hours

science GLEs

EC.1.A.4.b. Recognize different environments (i.e., pond, forest, prairie) support the life of different types of plants and animals.

vocabulary

Pond

Pond ecosystem

Forest

Forest ecosystem

Prairie

Prairie ecosystem

lesson objectives

1. Identify examples of different plants and animals found in pond, prairie and forest ecosystems.
2. Explain why different plants and animals live together in an ecosystem.

essential questions for the lesson

1. Why do different plants and animals live together in different ecosystems?
2. Why do different ecosystems support the life of different plants and animals?

teacher notes

Students should have read Chapter 2, “It’s What’s Inside That Counts,” on pages 4–9 of their student books prior to engaging in these activities.

Review the MDC video segments, which are included on your *Nature Unleashed* DVD, to determine which ones you want to incorporate where. MDC free publications *Feeding Backyard Birds*, *Hummingbirds*, *Bluebirds*, *Wetland Birds* poster, *Prairie Birds* poster should be ordered if you do not already have copies for classroom use.

NOTE: On the Forest—Layer of Leaves poster in the student books, #31 on the seedling in the bottom of the poster is a hickory seedling and not a sassafras seedling. The sassafras seedling (also labeled #31) is in the upper right hand corner of the poster.

outline of answers to objectives

See following page.

essential activities

Activity 2.1: It’s What’s Inside That Counts

Activity 2.2: There’s No Place Like Home

Activity 2.3: What Are You Doing Here?

Activity 2.4: Is There a Difference?

Activity 2.5: It’s For the Birds

optional activities

Optional Activity 2.A: MDC Video Segments

so, what do you know?—Lesson 2 questions and answer key

summary

Ponds, forests and prairies are all ecosystems found in Missouri. Each one is different, but each one has both living and non-living things and each one supports the survival of different types of plants and animals. Populations of plants and animals live in ecosystems that supply them with the food, water, shelter, air and space they need to survive.

outline of answers to objectives—lesson 2

1. Identify examples of different plants and animals found in a pond, prairie and forest.
 - a. Pond ecosystem—examples (pages 4, 5)
 - 1) Plants: algae, black willow tree, box elder tree, cattail, common sedge, coontail, duckweed, filamentous algae, pin oak tree, sycamore tree, yellow water lily, water primrose
 - 2) Animals: raccoon, muskrat, human, great blue heron, mallard duck, green frog, red-eared slider, common snapping turtle, northern water snake, northern crayfish, fishing spider, water strider, green darner dragonfly, mosquito, yellow drake mayfly, blue-fronted dancer damselfly nymph, blue-fronted dancer damselfly, giant floater mussel, predacious diving beetle, freshwater jellyfish, water flea, pond snail, largemouth bass, bluegill, fathead minnow, channel catfish, carp
 - b. Forest ecosystem (pages 6, 7)
 - 1) Plants: white oak and acorn, flowering dogwood, oak tree, hickory tree, redcedar, red maple seed, hickory nut and seedling, sassafras seedling, Virginia creeper vine, mayapple, Dutchman's breeches, blue violet, mosses
 - 2) Animals: bobcat, fox squirrel, white-tailed deer, woodland vole, wild turkey, white-breasted nuthatch, great horned owl, pileated woodpecker, ovenbird, gray treefrog, rough green snake, tiger salamander, three-toed box turtle, walking stick, baldface hornet nest, lo moth, spicebush swallowtail caterpillar, termites, carpenter ant, sowbug, centipede, earthworm, cicada nymph, Junebug grub
 - c. Prairie ecosystem (pages 8, 9)
 - 1) Plants: big bluestem, little bluestem, Indian grass, prairie blazing star, purple coneflower, switch grass, compass plant, sideoats grama grass, prairie fringed orchid, royal catchfly, prairie rose, blackberries, gaura
 - 2) Animals: badger, coyote, spotted skunk, prairie vole, plains pocket gopher, thirteen-lined ground squirrel, greater prairie-chicken, northern harrier, upland sandpiper, bobwhite quail, bobolink, grasshopper sparrow, northern crawfish frog, bullsnake, speckled kingsnake, ornate box turtle, great plains skink, grassland crayfish, regal fritillary, leaf beetle, honeybee, round-winged katydid, prairie mound ant, prairie mole cricket, yellow garden spider
2. Explain why different plants and animals live together in an ecosystem.
 - a. The ecosystem supplies their specific needs for air, food, water, shelter and space.
 - 1) Pond ecosystem (page 4)
 - a) Lots of water
 - b) Sunlight warms water and creates different layers of light that organisms use to find food and shelter.
 - c) Thick gooey mud at the bottom of the pond provides shelter and nutrients.
 - d) Water-loving plants and animals
 - e) Food provided by the plants and animals that live in and around the pond.
 - f) Some organisms live in the water; other organisms depend on the plants and animals that live in the pond.
 - 2) Forest ecosystem (page 5)
 - a) Land covered mostly by trees
 - b) 3 layers
 - (1) Canopy
 - (i) Lots of sun
 - (ii) Tallest trees that love lots of sun
 - (iii) Provides shade for understory and forest floor plants
 - (2) Understory
 - (i) Smaller shade-loving trees, shrubs and vines
 - (3) Forest floor
 - (i) Shade-loving plants
 - (ii) Roots of plants and trees compete with other organisms for nutrients, water and space in the soil
 - (iii) Provides homes for animals living on or below forest floor
 - (iv) Low-growing plants and layers of decaying leaves, branches and trees
 - c) Food provided by the plants and animals that live in every layer of the forest
 - d) Water—found in every layer of the forest

3) Prairie ecosystem (page 6)

- a) Lots of sunlight
- b) Many prairie grasses that grow in thick clumps and wildflowers (forbs)
- c) Few woody shrubs and trees
- d) Deep soil
- e) Water from rain & deep in the soil
- f) Shelter provided by prairie grasses that grow in thick clumps and burrows in the soil
- g) Food provided by the plants and animals that live there
- h) Space—travel lanes throughout the space between clumpy grasses and flowers
- i) Fire is a vital non-living part of the prairie to keep off trees and other plants that would take over and harm a prairie ecosystem.

activity 2.1 : it's what's inside that counts

estimated time 30 minutes to 1 hour

objectives

Students will be able to

1. Give examples of different plants and animals that live in pond, forest and prairie ecosystems.
2. Explain why different plants and animals live together in an ecosystem.

teacher preparation

Student should have read Chapter 2, "It's What's Inside That Counts," on pages 4–9 in their student books prior to engaging in these activities.

This activity may be done indoors or outdoors. Provide the full-sized posters for reference. Students will begin by referencing the full-sized posters only but will eventually reference the three book-sized posters provided in their student books in Chapter 2. This activity may be broken down into separate activities depending on available time. If completed on different days, have students prepare new science notebook headings for each activity part.

Information gathered from the posters and student books should be recorded in the appropriate columns on the specific *Big Chart* found in the center of each student's science notebook. *NOTE: Student Big Charts do not contain enough lines to accommodate every plant and animal listed in each of the three posters. Big Chart Ecosystem Teacher Keys are provided for each ecosystem poster and are comprehensive. Student entries based on the plants and animals they identify specifically or generically in their groups will vary. It is not necessary for students to record each and every plant and animal listed in the three poster keys. This activity suggests that students include at least 20 animals and 5 plants from each poster.*

materials

Science notebooks

Pencils

Thermometers (if outdoors)

Full-sized posters: *Missouri Pond Life*; *Forests—Layers of Leaves*; *Prairie—Life Among the Grasses*

Big Charts (in center of science notebooks)

Student books

procedure

1. Have students complete their science notebook headings and take and record outside air temperature, if outdoors.
2. Instruct students to open their science notebooks to the center pages to find their *Big Chart: Pond Ecosystem*. Explain that they will use this *Big Chart* as well as all the others to enter information throughout the unit.

Pond

3. Display *Missouri Pond Life* poster(s) for student reference.
4. Have students work in small groups to reference the full-sized *Missouri Pond Life* poster. Instruct students to use their *Big Chart: Pond Ecosystem* to list the following information from the pond poster:
 - a. animals (listed under "Organism" and then checked off under the "Animal" column)
 - b. plants (listed under "Organism" and then checked off under the "Plant" column)
 - c. non-living things (listed in the open box provided at the bottom of the chart)
5. Have students share their lists and add any plants, animals or non-living things they may have missed.
6. Instruct students to reference the *Missouri Pond Life* poster on pages 4 and 5 of their student book to add enough animals and plants to provide a total of at least 20 animals and 5 plants. They may include as many non-living things as they wish within the space provided.

Q. What do the organisms in your lists have in this pond ecosystem to help each of them survive?

A. Food (plants and other animals to eat), water, air, space, shelter (under water, in and around plants, mud, etc.).

7. Discuss the non-living things students listed (water; mud or soil; sunlight; temperature; rocks; landforms; air, etc.).
8. Using the *Missouri Pond Life* poster in their student books, have students look for interactions among living things with other living things and for interactions among living things and non-living things.
- Q. How are the organisms in your lists interacting with other living things? Why?**
- A. Answers will vary. A big fish is eating a smaller fish. A water bug is eating a tadpole. A fish is hiding in some plants. A dragonfly is resting on a leaf. A spider is eating a fish.
- Q. How are the organisms in your lists interacting with non-living things? Why?**
- A. Answers will vary. A crayfish is “living” in a hole in the mud. Fish, bugs, snails, crayfish, a turtle are “living” in the water. A beaver [looks as if it] is drinking the water. Animals are breathing the air. Plants are using light and using nutrients in the mud to grow.
- Q. I wonder why these plants and animals are part of this pond poster?**
- A. These plants and animals find what they need to survive here (food, water, shelter, space, etc.).

Forest

9. Have students work alone or in groups to reference the full-sized *Forests—Layers of Leaves* poster. Instruct students to use their *Big Chart: Forest Ecosystem* to record the following information from the forest poster:
- animals (listed under “Organism” and then checked off under the “Animal” column)
 - plants (listed under “Organism” and then checked off under the “Plant” column)
 - non-living things (listed in the open box provided at the bottom of the chart)
10. Have students share their lists and add any plants, animals or non-living things they may have missed.
- Q. What did you do with the shelf mushroom?**
- A. It is an organism but it is not considered a plant. It does not get its energy from the sun but from nutrients in dead or decaying matter.
11. Instruct students to reference the *Forests—Layers of Leaves* poster on pages 6 and 7 of their student book to add enough animals and plants to provide a total of at least 20 animals and 5 plants. They may include as many non-living things as they wish within the space provided.
- Q. What do the organisms in your lists have in this forest ecosystem to help each of them survive?**
- A. Food (plants and other animals to eat), water, air, space, shelter, nutrients. light, etc.
12. Discuss the non-living things students listed (water; soil; sunlight; temperature; rocks; landforms; air, etc.).
13. Using the *Forests—Layers of Leaves* poster in their student books, have students look for interactions among living things with other living things and for interactions among living things and non-living things.
- Q. How are the organisms in your forest lists interacting with other living things? Why?**
- A. Answers will vary. Squirrel, frog, owl, bird (nuthatch), and butterfly (moth) are resting on the tree. The salamander, insects (termites), sowbug, a bird (ovenbird), turtle (box turtle) are using a dead log [which was a living thing but is now no longer living] as shelter. A “mouse” (vole) is eating plants. A centipede is eating an ant.
- Q. How are the organisms in your lists interacting with the non-living things? Why?**
- A. Answers will vary. The plants are using light and nutrients from the soil. Everything is breathing the air. The temperature is warm enough for moths and insects and plants to live and grow.
- Q. [Optional question for discussion only] What forest plants and animals would you possibly see or not see in a savanna? Why?**
- A. Answers will vary. Possibly see: Deer, bobcat, birds, box turtles, etc. walking through, flying by, using some of the trees and grasses for food and shelter, etc. Possibly not see: Plants that need less light to survive, salamanders that need moisture, etc.

Prairie

14. Have students work alone or in groups to reference the full-sized *Prairie—Life Among the Grasses* poster. Instruct students to use their *Big Chart: Prairie Ecosystem* to record the following information from the prairie poster:
- animals (listed under “Organism” and then checked off under the “Animal” column)
 - plants (listed under “Organism” and then checked off under the “Plant” column)
 - non-living things (listed in the open box provided at the bottom of the chart)

15. Have students share their lists and add any plants, animals or non-living things they may have missed.
16. Instruct students to reference the *Prairie—Life Among the Grasses* poster on pages 8 and 9 of their student book to add enough animals and plants to provide a total of at least 20 animals and 5 plants. They may include as many non-living things as they wish within the space provided.
Q. What do the organisms in your lists have in this prairie ecosystem to help each of them survive?
A. Food (plants and other animals to eat), water, air, soil; sunlight; temperature; rocks; landforms; air, etc.
17. Discuss the non-living things students listed (water; soil; sunlight; temperature; rocks; landforms; air, etc.).
18. Using the *Prairie—Life Among the Grasses* poster in their student books, have students look for interactions among living things with other living things and for interactions among living things and non-living things.
Q. How are the organisms in your lists interacting with other living things? Why?
A. Answers will vary. A mouse (vole), a butterfly, bees, a turtle (three-toed box turtle), and a squirrel (thirteen-lined ground squirrel) are eating flowers and berries. A frog is eating a crayfish. Birds (quail) are landing in grasses. A spider is using a plant for shelter and to spin its web to catch food. A mouse (vole) is using dead grasses [still considered living things] as shelter.
Q. How are the organisms in your lists interacting with the non-living things? Why?
A. Answers will vary. Animals are using holes in the ground for shelter. Everything is breathing the air. Plants are using the light and temperature to grow and survive. Plants are using the nutrients in the soil to grow.

wrap-up/formative assessment See *Wrap-Up/Formative Assessments* in the Teacher Notes section of the introductory material to choose a strategy that meets student needs.

big chart—pond ecosystem answer key (includes all plants and animals listed on poster)

ORGANISM	Plant	Animal	Producer	Consumer	Herbivore	Carnivore	Omnivore	Decomposer	Scavenger	Predator	Prey
1–Raccoon		X		X			X			X	X
2–Muskrat		X		X			X			X	X
3–Human		X		X			X			X	
4–Great blue heron		X		X		X				X	X
5–Mallard duck		X		X			X			X	X
6–Green frog		X		X		X				X	X
7–Red-eared slider turtle		X		X			X			X	X
8–Common snapping turtle		X		X			X		X	X	X
9–Northern water snake		X		X		X				X	X
10–Northern crayfish		X		X	X				X		X
11–Fishing spider		X		X		X				X	X
12–Water strider		X		X		X				X	X
13–Green damer dragonfly		X		X		X				X	X
14–Mosquito		X		X			X				X
15–Yellow drake mayfly		X		X			X			X	X
16, 17–Blue-fronted dancer damselfly (nymph)		X		X		X				X	X
18–Giant floater mussel		X		X			X			X	X
19–Predacious diving beetle		X		X		X				X	X
20–Freshwater jellyfish		X		X			X			X	X
21–Water flea		X		X			X			X	X
22–Pond snail		X		X	X						X
23–Largemouth bass		X		X		X				X	X
24–Bluegill		X		X		X				X	X
25–Fathead minnow		X		X			X			X	X
26–Channel catfish		X		X			X		X	X	X
27–Common carp		X		X			X		X	X	X
28–Algae	X		X								
29–Coontail	X		X								
30–Duckweed	X		X								
31–Water primrose	X		X								
32–Yellow water lily	X		X								
33–Common sedge	X		X								
34–Cattail	X		X								
35–Black willow tree	X		X								
36–Box elder tree	X		X								
37–Pin oak tree	X		X								
38–Sycamore tree	X		X								
Non-living things—water, mud, rocks, air, sun, temperature				Notes							

big chart—forest ecosystem answer key

(includes all plants and animals listed on poster)

ORGANISM	Plant	Animal	Producer	Consumer	Herbivore	Carnivore	Omnivore	Decomposer	Scavenger	Predator	Prey
1–Bobcat		X		X		X				X	X
2–Fox squirrel		X		X	X						X
3–White-tailed deer		X		X	X						X
4–Woodland vole		X		X	X						X
5–Wild turkey		X		X			X			X	X
6–White-breasted nuthatch		X		X			X			X	X
7–Great horned owl		X		X		X				X	X
8–Pileated woodpecker		X		X			X			X	X
9–Ovenbird		X		X		X				X	X
10–Gray treefrog		X		X		X				X	X
11–Rough green snake		X		X		X				X	X
12–Tiger salamander		X		X		X				X	X
13–Three-toed box turtle		X		X			X			X	X
14–Walking stick		X		X	X						X
15–Baldface hornet nest (not an organism)											
16–Io moth		X		X	X						X
17–Spicebush swallowtail caterpillar		X		X	X						X
18–Termite		X		X				X			X
19–Carpenter ant		X		X		X		X	X	X	X
20–Sowbug		X		X				X	X		X
21–Centipede		X		X		X				X	X
22–Earthworm		X		X				X	X		X
23–Cicada nymph		X		X	X						X
24–Junebug grub		X		X	X						X
25–White oak and acorn tree	X		X								
26–Flowering dogwood tree	X		X								
27–Oak and hickory forest (not one organism)											
28–Redcedar tree	X		X								
29–Red maple seed tree	X		X								
30, 31*–Hickory nut and seedling <small>(*Seedling labeled #31 by the squirrel is a hickory seedling)</small>	X		X								
31*–Sassafras seedling <small>(*Seedling labeled #31 in the upper right corner is the sassafras seedling)</small>	X		X								
32–Virginia creeper vine	X		X								
33–Mayapple	X		X								
34–Dutchman’s breeches	X		X								
35–Blue violet	X		X								
36–Moss	X		X					X			
37–Shelf mushroom								X			
Non-living things—water, rocks, air, sun, temperature					Notes						

big chart—prairie ecosystem answer key

(includes all plants and animals listed on poster)

ORGANISM	Plant	Animal	Producer	Consumer	Herbivore	Carnivore	Omnivore	Decomposer	Scavenger	Predator	Prey
1–Badger		X		X		X				X	X
2–Coyote		X		X			X		X	X	X
3–Spotted skunk		X		X			X		X	X	X
4–Prairie vole		X		X	X						X
5–Plains pocket gopher		X		X	X						X
6–Thirteen-lined ground squirrel		X		X			X			X	X
7–Greater prairie-chicken		X		X			X			X	X
8–Northern harrier hawk		X		X		X				X	X
9–Upland sandpiper		X		X			X			X	X
10–Bobwhite quail		X		X			X			X	X
11–Bobolink		X		X			X			X	X
12–Grasshopper sparrow		X		X			X			X	X
13–Northern crawfish frog		X		X		X				X	X
14–Bullsnake		X		X		X				X	X
15–Speckled kingsnake		X		X		X				X	X
16–Ornate box turtle		X		X			X			X	X
17–Great plains skink		X		X		X				X	X
18–Grassland crayfish		X		X			X	X	X	X	X
19–Regal fritillary butterfly		X		X	X						X
20–Leaf beetle		X		X	X						X
21–Honeybee		X		X	X						X
22–Round-winged katydid (pink form)		X		X	X						X
23–Prairie mound ant		X		X				X	X	X	X
24–Prairie mole cricket		X		X			X			X	X
25–Yellow garden spider		X		X		X				X	X
26–Big bluestem	X		X								
27–Little bluestem	X		X								
28–Indian grass	X		X								
29–Prairie blazing star	X		X								
30–Purple coneflower	X		X								
31–Switch grass	X		X								
32–Compass plant	X		X								
33–Sideoats grama grass	X		X								
34–Prairie fringed orchid	X		X								
35–Royal catchfly	X		X								
36–Prairie rose	X		X								
37–Blackberries	X		X								
38–Gaura	X		X								
Non-living things —water, rocks, air, sun, temperature				Notes							

activity 2.2 : there's no place like home

estimated time 20–30 minutes

objectives

Students will be able to

1. List shared characteristics of plants and animals found in all three pond, forest, and prairie ecosystems.
2. Explain why certain plants and animals would be found only in a pond, forest or prairie ecosystem.

teacher preparation

Have full-sized Pond, Forest and Prairie posters available. This activity may be done indoors or outdoors.

materials

Science notebooks

Pencils

Thermometers

Big Charts

procedure

1. Have students complete their science notebook headings and take and record outside air temperature. Instruct them to make two column headings on their notebook page: **SAME PLANTS** and **SAME ANIMALS**
2. Instruct students alone or in groups to reference the information they entered on all three of their *Big Charts* from *Activity 2.1*.
3. Have students make a small dot in pencil next to all the same plants that are listed in all three ecosystem *Big Charts* and then record the “dotted” plants under the “SAME PLANTS” heading in their notebook.
4. Have students make a small star in pencil next to all the same animals that are listed on all three ecosystem *Big Charts* and then record the “starred” animals under the “SAME ANIMALS” heading in their notebook.
5. Have students share their lists in their groups and/or with the class.
6. Discuss whether or not the plants and animals listed as being found in all three ecosystems are really the same plants or animals.
 - Q. Some of you have listed turtles/birds/snakes/etc. as being the same animals found in all three ecosystems. I wonder if these are really the same kinds of turtles/birds/snakes/etc.**
 - A. These turtles/birds/snakes are not exactly the same on these posters. These turtles/birds/snakes/etc. are different kinds of turtles/birds/snakes/etc.
 - Q. Why wouldn't they be the same?**
 - A. The red-eared slider in the pond needs water more than the box turtles found in the forest and prairie. The great blue heron eats mostly fish, so it would probably not find what it needs to eat in a forest or prairie. All snakes are able to swim, but the water snake needs to be close to water to catch its food of fish and frogs while the forest and prairie snakes eat the rodents and birds found in their ecosystems.
7. Some of you listed flowers, grasses, trees, etc. as plants found in all three ecosystems.
 - Q. How might pond plants such as duckweed, cattails and algae survive in a forest?**
 - A. Answers will vary. These plants need water more than the forest plants and more than they would find in a forest—except temporarily during times of flooding. These plants would not be able to survive without sufficient water and sunlight in an ecosystem with so many trees and such a dense canopy.
 - Q. How might an oak tree (forest) or a coneflower (prairie) survive in the middle of a pond?**
 - A. These plants would not survive because there would be too much water.
 - Q. I wonder why there are frogs in all three ecosystems.**
 - A. These are different types of frogs with different ways of interacting with their environments, and they find what they need to survive in their different ecosystems. The green frog in the pond does leave the water but only for short periods of time. The gray

treefrog in the forest needs to keep its skin moist but not constantly wet. [Camouflage is discussed in Chapter 3, but students who know the concept might notice how well the gray treefrog and green frog blend into their environments and use that as reasoning for those frogs being found in different ecosystems.] The northern crawfish frog finds its preferred food (grassland crayfish) in the prairie.

8. Throughout these discussions, instruct students to erase the light dots and stars placed next to the plants and animals they thought were the same but now realize are not and are not found in all three ecosystems. According to these posters, there would not be any plants or animals left with dots or stars. No specific plant or animal is found in all three ecosystems.

Q. Why do you suppose these plants and animals are found on only one of these three ecosystem posters?

- A. The plants and animals on these posters find exactly what they need to survive in their ecosystems. Each ecosystem meets the basic needs of the plants and animals illustrated and listed on each poster.

Q. I wonder if this is exactly how it is in real ponds, forests or prairies? If you were walking in a real prairie, what pond or forest animals do you think you might see? Why?

- A. Answers may vary but could include humans, deer, mosquitoes, dragonflies, bobcats, snakes, some insects, etc. These animals would possibly move through the different ecosystems in search of food, water, shelter (temporary), recreation (humans), etc. Some might even spend extended periods of time in one or more of them if they are able to find their basic needs. Trees are plants that grow in places other than just forests, and cattails are not only found growing in or near ponds.

wrap-up/formative assessment See *Wrap-Up/Formative Assessments* in the Teacher Notes section of the introductory material to choose a strategy that meets student needs.

activity 2.3 : what are you doing here?

estimated time 20–30 minutes

objective

Students will be able to

1. Compare and contrast their schoolyard ecosystem with pond, forest and prairie ecosystems.
2. Predict which ecosystem (pond, forest or prairie) is most like the schoolyard ecosystem.

teacher preparation

This is an outdoor activity. Take a brief preparatory walk around the schoolyard and note where you find examples of ecosystem components in the schoolyard. During the course of the activity, if students are unsure and/or unable to find examples, refer to your notes and provide subtle prompts for students to discover examples. Be prepared to prompt students for sensory observations.

Students will reference and fill in the *Big Chart: Schoolyard Ecosystem* by observing and collecting data on their schoolyard/outdoor area.

materials

Science notebooks

Pencils

Thermometers

Big Charts

procedure

1. Have students complete their science notebook headings and take and record outside air temperature.
2. Ask students to predict which ecosystem (pond, forest or prairie) is most like their schoolyard ecosystem.
3. Instruct students to stay in one place for a few moments, close their eyes and think about what they smell, hear and feel. After a few moments, have them open their eyes and record their sensory observations in their science notebooks. Provide prompts, if necessary, while their eyes are closed.
 - Q. How does your skin feel out here today? Why?**
 - A. Answers will vary. Warm from sunshine; too hot because the temperature is so high; sweat on their faces from the gym class they just finished; cool from shade or wind; very cold from wind and temperature; wet from rain or fog, etc.
 - Q. What kinds of smells and sounds do you notice?**
 - A. Answers will vary. Smell of the concrete because it is wet from rain; flowery smells from a nearby garden; earthy smells from damp soil; truck, bus, car exhaust smells from nearby traffic; sweet smells of someone's perfume; etc. Sounds of nearby traffic, children at recess, people talking near the school; bird songs/calls; crickets chirping or insects buzzing; wind blowing through the trees or making the American flag on the school's flagpole flap; dogs barking, etc.
 - Q. How comfortable are you right now here in your schoolyard ecosystem?**
 - A. Answers will vary.
 - Q. While you are part of this schoolyard ecosystem, do you have what you need to survive?**
 - A. Answers may vary, but basically, basic needs of the students are met—food, water, shelter, air and space.
 - Q. Looking around carefully, what other living things do you see besides humans?**
 - A. Answers will vary. Refer to your notes to provide prompts: birds by the fence; grass and flowers in the outdoor classroom; weedy looking plants growing in the sidewalk cracks; insects crawling around the sidewalk cracks; insects flying around; rabbits in the bushes, etc.
 - Q. What are they doing here in your schoolyard ecosystem?**
 - A. They have what they need (food, water, shelter, air, space, etc.). These plants and animals have things to eat and places to hide and grow, etc. This is a comfortable temperature for them, etc.

4. Instruct students alone or in groups to open their science notebooks to the *Big Chart: Schoolyard Ecosystem*.

5. Explain that they have used posters of other ecosystems to observe living and non-living things found in each. Now they will do the same with their schoolyard ecosystem and add the information to their *Big Chart: Schoolyard Ecosystem*.
6. Instruct students to observe their schoolyard carefully, standing in one place and turning to look all around or moving slowly within the designated area. The slower they move, the more they will see, and the fewer animals they will startle and scare off.
7. Instruct students to refer to their original science notebook lists of living and non-living things observed in the schoolyard from *Activity 1.3* and include any organisms from those lists not in their *Big Chart: Schoolyard Ecosystem*.
8. Have them share their updated *Big Chart: Schoolyard Ecosystem* lists with the class.
 - Q. Why do you think these plants and animals (organisms) were observed in our schoolyard ecosystem?**
 - A. Answers will vary. These organisms find what they need to survive here—food, water, shelter, air and space, etc.
 - Q. There might be other organisms that pass through our schoolyard ecosystem, but why do you think these are the only ones we observed today?**
 - A. Other living things may be too big to find food and shelter here. This area doesn't have the right food for some other living things. There isn't enough soil/dirt for other/more plants to grow. There may be more animals here, but we just can't see them now, etc.
9. Instruct students to look around their schoolyard ecosystem and list at the bottom of their *Big Chart: Schoolyard Ecosystem* the non-living things they observe.
10. Have students share their lists in their groups or with the class.
 - Q. Looking at all your *Big Charts*, how do the plants, animals and non-living things in your schoolyard ecosystem compare to those of the pond, forest and prairie?**
 - A. Answers will vary depending on school's location and setting.
 - Q. What were some of the organisms you observed here today that surprised you or didn't seem as if they belonged in our schoolyard ecosystem?**
 - A. If there are no ponds or other water sources in the schoolyard ecosystem but students observed dragonflies, cattails, raccoons, etc. there might be a pond or other water source nearby, and the animals were moving among environments and ecosystems to find food, water, shelter and space. Cattails often grow in areas that stay boggy but not necessarily full of water all the time.
 - Q. Why do you suppose they were here?**
 - A. The schoolyard ecosystem isn't a forest by definition, but there are trees growing in it. Trees are plants that also grow in places other than forests. Animals from the prairie poster such as bees, birds, and insects (even snakes and turtles) often move among environments because their basic needs are met.
11. Have students work alone or in groups to create Venn diagrams to illustrate each of the following ecosystem relationships:
 - a. Pond/Schoolyard
 - b. Forest/Schoolyard
 - c. Prairie/Schoolyard
 - Q. Which of the three ecosystems (pond, forest or prairie) did you predict would be most like your schoolyard ecosystem?**
 - A. Student predictions may vary.
 - Q. Which of the three ecosystems (pond, forest or prairie) is most like your schoolyard ecosystem?**
 - A. Answers will vary.
12. Based on what you have read, on your observations, and on our discussions, raise your hand if you think our schoolyard ecosystem is most like a pond ecosystem. Note the number on the board. Ask a student or students with raised hands to explain why. Repeat for the forest ecosystem and for the prairie ecosystem.
 - Q. Which of the three ecosystems (pond, forest or prairie) is most like your schoolyard ecosystem?**
 - A. The schoolyard may clearly reflect characteristics of one of the three ecosystems. If it appears to share characteristics of the other ecosystems, have students list the shared characteristics and decide on one ecosystem with the most characteristics in common with the schoolyard.

wrap-up/formative assessment

Have students write a summary paragraph to explain the components of an ecosystem.

evaluation

See *Summary Paragraph Guidelines and Scoring Key* in Appendix E of this Guide.

extension activities

Extension Activity 1: My Backyard Is Most Like?

Have students compare their backyards to the schoolyard. Which ecosystem is their backyard most like? Have students write a short essay on their choice or sketch/illustrate their backyard in their science notebooks and label elements of their backyards that reflect the comparable ecosystem.

Extension Activity 2: Tree Investigation

Have students stand by a tree and observe any activity at or on the tree. They should record the information in their science notebooks.

1. How big is the tree (approximately)? (It's so big I can't wrap my arms around the trunk. I can just barely wrap my hands around the trunk. I can wrap my hands around the trunk.)
2. What type of tree is it?
3. How many different types of organisms do you see and how many of each?
4. What part of the tree did you find each type of organism?
5. Do you see single organisms or populations of organisms? Explain.

Extension Activity 3: Web Investigation

Have students select either a pond, forest or prairie ecosystem to research using the Internet. Students should prepare and present a short report on that ecosystem. Each report should include the following:

1. Two new facts learned about the ecosystem in general
2. Descriptions of two organisms (plant and/or animals) not mentioned on the poster of that ecosystem in their student book plus information on what each eats (for animals) or what eats it (for plants and animals)
3. One outrageous, disgusting, amazing, incredible, etc. fact about each of the two new organisms.

activity 2.4 : is there a difference?

estimated time 20–30 minutes

objectives

Students will be able to

1. Explain why different plants and animals live together in an ecosystem.
2. Describe factors that affect observation of organisms in an ecosystem.

teacher preparation

This is an outdoor activity. Take a brief preparatory walk around the schoolyard and note your observations of living things. Note any changes in what you observe today compared with earlier walks and outdoor activities. Students will be asked to observe and record these kinds of differences. During the course of the activity, if students are unsure and/or unable to notice any differences, refer to your notes and provide subtle prompts for students to discover examples. Be prepared to encourage students to look closely at the ground near trees and plants and underneath rocks, mats, pieces of wood, piles of sand or soil, etc. Some of the differences may be observed because students are prompted to look more closely at the schoolyard areas.

Create a classroom chart of student outside air temperature data for comparison. Students can reference it to recognize and discuss patterns, relationships, etc. between outside air temperature and animal behavior, organism interactions, etc.

materials

Science notebooks

Pencils

Thermometers

procedure

1. Have students complete their science notebook headings and take and record outside air temperature.
2. Instruct students alone or in small groups to move around and investigate their schoolyard/outdoor area carefully. Instruct students to record their observations in their science notebooks.
3. After a few moments, have students share their observations.
Q. What differences do you notice today compared to what you observed and recorded in your science notebooks from other days? Why do you think there are these differences?
A. Answers will vary. More birds and insects because the weather warmed up; fewer animals because it is raining; no bees in the grassy and flower area because someone mowed the plants, etc. It's a different time of day, so there are fewer kids at recess. It's a colder day, so animals are somewhere trying to keep warm. Birds may be more active other times of the day. Trees have lost more of their leaves because it's fall and it was windy last night, etc.

wrap-up/formative assessment

Allow students time to sit quietly outside and illustrate the differences or describe in words how and why something they observed during this activity surprised them because it was different from earlier observations.

activity 2.5 : it's for the birds

estimated time Varies (1–2 hours)

objectives

Students will be able to

1. Research birds common to their schoolyard ecosystem and explain why and how certain birds should/could be attracted to their schoolyard ecosystem for observation.

teacher preparation

Consider bringing student outside for this brainstorming activity especially if you have noticed increased bird activity recently.

For extensive information on birds common to the area near the school, visit Cornell University's Ornithology Web site www.birds.cornell.edu/AllAboutBirds/BirdGuide. Have bird field guides (provided in the classroom kit) available to students. Have MDC publications available (*Feeding Backyard Birds*, *Hummingbirds*, *Bluebirds*, *Wetland Birds* Poster, *Prairie Birds* Poster, etc.). Birdseed can be costly. However, retailers (Wal-Mart; PetSmart; PETCO; Lowe's; various supermarkets and hardware stores; etc.) often discard birdseed bags that are torn or damaged. Contact local retailers to find out if they 1) have any damaged bags of seed available for free and/or 2) would they contact you if and when they do have damaged bags they would willing to donate to your class. Bird feeders are also costly to purchase and to build, but there are many simple, inexpensive ways to feed birds using natural objects and recycled materials. If possible, schedule a student/parent/family night to create recycled bird feeders.

materials

Science notebooks

Pencils

Thermometers

Field guides to North American birds/Eastern US birds

MDC bird publications

Internet access

Library books

procedure

1. Have students complete their science notebook headings and take and record outside air temperature.
 - Q. We know that our schoolyard ecosystem does have some/all of the basic things organisms need to survive (water, food, shelter, air and space). Considering what our ecosystem does have, what animals would be easy and safe to try to attract to our schoolyard ecosystem for observation over a long period of time?**
 - A. Answers may vary, but provide prompts to support suggestions that birds would be safe and (possibly) easy to attract. Acknowledge other suggestions and discuss why these might be difficult, dangerous, etc., to attract to the schoolyard ecosystem.
 - Q. I wonder how we might be able to attract more birds.**
 - A. If there were food, water and shelter for the birds, they would find what they needed around the schoolyard ecosystem and would stay near the area. They would be easy to observe.
 - Q. How would we know which ones to attract and how to attract them?**
 - A. Research birds that would be in Missouri all year and the types of food they eat. Use the Internet or school library to research birds common to the area.
2. Have students work alone or in groups to decide their research methods, options and choices.
3. Instruct each one/group to compile a list of birds commonly found in the area near the school. Consolidate all lists, have students vote on their top 10–20 (depending on class size) and divide the birds evenly among the students/groups. Students/groups should research 2–4 birds.

4. Instruct students/groups to provide answers to the following questions for each of their assigned birds:
 - a. What part of the year is this bird found in the area?
 - b. What does the bird eat?
 - c. How would you provide this food for the bird?
 - d. Where does the bird prefer to nest?
 - e. Why and how would you provide shelter for this bird?
 - f. What eats this bird?
5. Have students present the information for each of their birds and discuss which ones would be easiest to attract and observe. Have students vote individually or as groups on their top three, four, etc., choices.
6. *Attempt to attract at least three or four common birds. Other birds will probably be attracted to the feeders, and these will provide additional observation opportunities.*
7. Once birds have been decided, instruct students/groups to refer to earlier research by the class and brainstorm how they will provide the food for the chosen birds.
8. Encourage students to investigate using recycled materials to create the feeders.
9. Plan a time to create feeders and to place them (preferably outside the classroom window) where students will easily observe, collect data and maintain records of their behavior and interactions throughout the Unit/year.

wrap-up/formative assessment See *Wrap-Up/Formative Assessments* in the Teacher Notes section of the introductory material to choose a strategy that meets student needs.

optional activity 2.a : mdc video segments

1. *Forest: Frogs & Grouse* (5:01 minutes)—Discover what the ruffed grouse and the wood frog have in common at Daniel Boone Conservation Area near Warrenton.
2. *Salamanders* (4:20 minutes)—Tag along as MDC herpetologist Jeff Briggler goes in search of one of our state's least-seen and least-known creature: some of Missouri's 19 species of salamanders.
3. *Wildflowers* (5:10 minutes)—Experience the color and beauty of Missouri wildflowers. From coneflower to coreopsis, spiderwort to shooting star, larkspur to lily, Fleabane to foxglove and daisy to dogwood, we'll bring you the flowering beauty found in the Show-Me State.
4. *Parking Lot Prairie* (8:29 minutes)—Before there were parking lots and plows, there were prairies. Join a group of Kansas City students in their attempt to turn back time.
5. *Prairie Day St. Louis* (6:07 minutes)—Spend a day on the prairie at this special event west of St. Louis.
6. *Prairie Day Kansas City* (4:51 minutes)—Enjoy an annual Kansas City area event: a toe-tapping encounter with life...as it is and as it was...on Missouri's vanishing prairie.
7. *Prairie-chickens #1* (7:06 minutes)—Their numbers are on the decline. Journey to west-central Missouri and see how local citizens are working together in an effort to save the greater prairie-chicken.
8. *Prairie-chickens #2* (5:40 minutes)—Visit a "booming" business that's helping spread the word about the plight of Missouri's fascinating prairie-chickens...a plight that could still lead to extinction.

so, what do you know?—lesson 2

1. A _____ ecosystem is a watery environment. It has mud, sunlight, air, shelter and temperature. Some plants and animals live in water all or part of their lives. Others may not live in the water, but depend on the plants and animals that do.
2. Lots of large trees that love the sun and lots of small trees, shrubs, vines and other shade-loving plants live with animals that depend on the air, water, shelter, sunlight, soil, and food found in a _____ ecosystem.
3. Huge grasslands with many types of clump grasses and wildflowers are part of _____ ecosystems. Animals that depend on these plants and non-living things for food, water, shelter, light and air live here.
4. In the blank by each living thing, write the name (pond, forest or prairie) of the ecosystem that plant or animal is part of.

_____ Three-toed box turtle

_____ Ornate box turtle

_____ Bass

_____ Prairie vole

_____ Big bluestem

_____ Purple coneflower

_____ Blackberries

_____ Regal fritillary butterfly

_____ Cattail

_____ Sassafras seedling

_____ Duckweed

_____ Sideoats grama grass

_____ Grasshopper sparrow

_____ Snapping turtle

_____ Great horned owl

_____ Fox squirrel

_____ Mallard duck

_____ Tiger salamander

_____ Mayapple

_____ White oak

_____ Muskrat

_____ Yellow water lily

so, what do you know?—lesson 2

answer key

1. A pond ecosystem is a watery environment. It has mud, sunlight, air, shelter and temperature. Some plants and animals live in water all or part of their lives. Others may not live in the water, but depend on the plants and animals that do. (1 point)
2. Lots of large trees that love the sun and lots of small trees, shrubs, vines and other shade-loving plants live with animals that depend on the air, water, shelter, sunlight, soil, and food found in a forest ecosystem. (1 point)
3. Huge grasslands with many types of clump grasses and wildflowers are part of prairie ecosystems. Animals that depend on these plants and non-living things for food, water, shelter, light and air live here. (1 point)
4. In the blank by each living thing, write the name (pond, forest or prairie) of the ecosystem that plant or animal is part of. (1 point each, total 22 points)

<u>Forest</u>	Three-toed box turtle	<u>Prairie</u>	Ornate box turtle
<u>Pond</u>	Bass	<u>Prairie</u>	Prairie vole
<u>Prairie</u>	Big bluestem	<u>Prairie</u>	Purple coneflower
<u>Prairie</u>	Blackberries	<u>Prairie</u>	Regal fritillary butterfly
<u>Pond</u>	Cattail	<u>Forest</u>	Sassafras seedling
<u>Pond</u>	Duckweed	<u>Prairie</u>	Sideoats grama grass
<u>Prairie</u>	Grasshopper sparrow	<u>Pond</u>	Snapping turtle
<u>Forest</u>	Great horned owl	<u>Forest</u>	Fox squirrel
<u>Pond</u>	Mallard duck	<u>Forest</u>	Tiger salamander
<u>Forest</u>	Mayapple	<u>Forest</u>	White oak
<u>Pond</u>	Muskrat	<u>Pond</u>	Yellow water lily